



Testimony of

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**BEFORE THE COMMITTEE ON SMALL BUSINESS &
ENTREPRENEURSHIP**

UNITED STATES SENATE

**40 Years of Success:
SBIR drives America's High Tech Economy
Technology Innovation, Competitiveness and High Quality Jobs**

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On behalf of

The Small Business Technology Council

www.sbtc.org

SBTC is the nation's largest association of small, technology-based companies in diverse fields, and represents more companies that are active in the federal Small Business Innovation Research (SBIR) Program than any other organization. SBTC is proud to serve as the technology council of the National Small Business Association.



SBIR drives America's High Tech Economy Technology Innovation, Competitiveness and High Quality Jobs

We know America's small businesses (which employ ~35% of our scientists and engineers) are our primary innovators and job creators, led by entrepreneurs developing new products and services for our economy, and capable of and focused on building their businesses.

Yet Federal R&D is still done primarily by large businesses, national labs and universities. Congress realized this disconnect: Federal R&D is not being done by America's primary innovators and job creators best able to carry the result forward into U.S.-based products and services and jobs to strengthen the American economy. Consequently, Congress in 1980 piloted the Small Business Innovation Research (SBIR) program and expanded the program in 1982 to make sure that at least a small fraction of Federal R&D is done by small businesses. The result has become a primary driver of American innovation, economic advantage and good jobs.

The genius of the SBIR program is it enlists our nation's small businesses to competitively convert American science into new scientific breakthroughs and useful technology innovations that meet Federal R&D needs while enabling entrepreneurs to build businesses and American jobs. SBIR, and its sister program STTR, draw small businesses into Federal R&D, resulting in substantially more technology innovation and American-based products, services and jobs growth.

SBIR firms must be American-based/owned small businesses, with work done in the U.S. Topics are set by the agencies, which competitively select among small business proposals based on merit to meet agency objectives. The R&D offers to meet agency-defined market and societal needs, and create new sustainable high quality, high paying manufacturing and service jobs in the U.S. while raising living standards and making American industry more competitive.

This highly competitive program is successful in creating both innovations and resulting products and services for both commercial and Federal requirements.

- Competitive merit selection: Only ~1 in 20 Phase I proposals for exploratory proof of concept work advances to substantial agency R&D support in Phase II.
- High quality R&D: The result is high quality R&D in Phase II directed to agency objectives and transforming American technology for the future.
- Commercialization: A primary objective is Phase III transition and commercialization of the R&D, funded outside the SBIR program. This has driven business and jobs growth in the small businesses and in larger businesses who acquire or license the new high tech.
- Broad participation: SBIR has helped women and minorities and underserved states to boost their participation in Federal R&D. SBIR has broadened national access to America's tech economy across all 50 states while also boosting participation by women-owned firms, minority-owned firms, and others to build new businesses, all based on selecting the best proposed technological for the agency topics.

SBIR remains a very small program: only ~2% of total Federal R&D expenditures (3.2% of extramural R&D). Many studies have recommended growing it, based on its outsized performance (e.g. the EU is investing over 20% of its R&D in small businesses). For manufacturing and for many other sectors, it is virtually the only source of early stage funding),



generating innovation and job creation better than any other innovation program in America. Internationally, many countries are investing their R&D heavily in small business, with 17 copying the SBIR program.

The result: over 40 years of a clear success story. SBIR has become a primary driver of American innovation, economic advantage and good jobs. It has brought small business ingenuity and entrepreneurial drive into Federal R&D, disrupting old approaches and creating myriad new technologies. The result has been new American industries, new businesses and high quality jobs while growing America's technology competitiveness across a more diverse population and all 50 states.

The SBIR program is currently set to expire on **September 30, 2022**. The sooner it is reauthorized, the sooner both small businesses and agencies can begin to plan for the future. Uncertainty is the enemy of long-term investment. The closer the SBIR program its expiration, the more all parties think short term and defensively, rather than the strong sustained drive for future innovations that should be the focus on the program. SBTC urges Congress to reauthorize SBIR this year, don't wait until the last minute and leave small businesses guessing whether or not the program will exist in 2023.



SBIR Works

SBIR R&D projects are technology seed corn, planted in small businesses committed to grow them into new products. Despite only ~2% of overall Federal R&D funding, SBIR/STTR's outsized results are a primary driver of American economic strength. SBIR/STTR firms have created over 20% of the world's major innovations¹, and as many patents as all universities combined (which receive 10X the R&D funding). SBIR firms significantly outperform larger firms on patent productivity. High quality R&D tackles Federal challenges and creates new innovations, while seeding new startups and driving the growth of small businesses with their new technology products and services. Global giants such as Qualcomm, Broadcom, Symantic, Biogen, iRobot, Genzyme, Illumina, and Genentech all emerged from SBIR funding. Other SBIR businesses and technologies were sold or licensed, revitalizing older industries while cutting costs and growing competitive strength, and generating new divisions and new jobs located here in America. Follow-on new product investment and sales have totaled many hundreds of billions of dollars.

SBIR firms have produced life-changing breakthroughs in defense, energy, communications, information and bioscience - new tech building blocks for American manufacturing. Agency mission objectives were accomplished. DOD strengthened capabilities while cutting costs. The National Cancer Institute has produced \$33 in economic output for every SBIR R&D dollar, creating \$26 billion in economic impact from \$787 million in SBIR awards. An NIH program for home sleep testing saves health care payers over \$34 million per year. The Air Force's SBIR program saved the F-35 JSF program over \$500 million, while Navy SBIR projects have boosted performance and saved substantially across the submarine fleet.

The data supports SBIR success, and suggests doing more can increase its success. The SBIR/STTR program clearly provides a big bang for the federal R&D dollar, an unmatched economic growth engine.

- 19 National Academy of Sciences studies have been conducted on the programs, and have concluded that SBIR has met its goals, and showed SBIR/STTR Phase II awards commercializing at rates from 45-70 percent.
- Economic impact studies at the Navy, Air Force, DOD and the National Cancer Institute show remarkable impact on America, e.g. in excess of \$15 to \$23 for every SBIR dollar over a 14 year period.² Results included improved military strength and capability, significant cost-savings, new industries with new products and services, and new life saving medical techniques and products. Job quality was high, with high average incomes, e.g. \$68,535 in the Navy study.
- The studies understate the impact, not capturing the impact of SBIR licenses or business acquisitions on the licensing or acquiring business's sales and competitiveness.
- Tax income in the period more than repaid the SBIR R&D funding: up to over \$3 in increased Federal, state and local taxes for every dollar spent on SBIR.

¹ Fred Block and Matthew Keller, *Where Do Innovations Come From? Transformations in the U.S. National Innovation System 1970-2006*, Information Technology and Innovation Foundation, July 2008.

² Swearingen, Will and Jeffrey Peterson, "National Economic Impacts from Air Force and Navy SBIR/STTR Programs, 2000-2013"; "1998-2018 National Economic Impacts from the National Cancer Institute SBIR/STTR Programs"; and "National Economic Impacts from the DOD SBIR/STTR Programs 1995-2018" Techlink



- Depending on agency, 45-70% of SBIR small business awardees include university faculty. 70% of all university licenses are issued to SBIR and other small/startup firms.³

SBIR supports and drives American technology transformation: Further American economic infrastructure revitalization offers further opportunity for improved performance via SBIR/STTR innovation and new STEM impacts further transforming the defense, energy, bioscience, communication, and information industries. SBIR/STTR infusion offers the potential for simultaneous performance improvements and dramatic cost reductions throughout our economy as we reinvigorate and grow our economy, export base and competitive strength, building a stronger American internationally competitive base. Further, small businesses have a far greater tendency to locate their resulting new jobs in the United States, compared to large businesses.

In many sectors, SBIR/STTR funding is the primary source of external R&D funding:

SBIR/STTR invests at the innovation R&D stage – well before Venture Capital (VC) and banks will provide risk capital. Successful SBIR technologies advance to use VC and bank lending as they mature towards products as well as to advance to larger non-SBIR Federal agency support where this is appropriate (e.g. for larger, more advanced agency needs using regular program support). Also SBIR innovation is directed across America's innovation opportunities, well beyond the VC-focused sectors such as software, internet, telecommunication and healthcare (which receive 83% of VC deals). The broader sectors SBIR primarily supports include manufacturing, defense, energy, and the environment, all key to growing America's economy. This is increasingly important as VC funding and VC-created jobs increasingly move out of the United States. Over 90% of VC money used to be invested in the US, that is now halved to 44.9%; \$156B worldwide, of which \$70B invested in the US.⁴ And small businesses have a great record on keeping their jobs in the U.S., being much less likely to outsource their jobs after product development.

Those who can't find funding in the U.S. are turning overseas for help commercializing their research. One Chinese organization, BICI, has developed 158 U.S. research projects and has funded over \$616 million for commercialization of U.S. funded research, moving the commercial jobs from U.S. research to China. So far BICI has commercialized 108 such projects.¹

SBIR/STTR is a force for diversification and broadening of America's technology base. SBIR reaches out to underserved states and groups, broadening the impact and strengthening national STEM results. This is the result of merit-based selections and openness to new entrants. In making award decisions based upon supporting the best technologies, helps open broader competition and break down geographic, ownership and existing market power restrictions in America's technology's sector. VC funding is concentrated in just a few areas of the US; SBIR reaches all the states and far outstrips VC investment in terms of women and disadvantaged minority participation. The SBIR program is critical to providing startup capital to all parts of the nation.⁵

³ Association of University Technology Managers (AUTM), *FY2016 AUTM US Licensing Activity Survey*, 2018

⁴ "State of Venture Report, Global Q2 2021, CB Insights

⁵ Of \$70B VC funding in the US, \$23.7B was in Silicon Valley, \$11.2B in New York, \$7.8B in Boston, and \$6.0B in LA (State of Venture Report, Global Q2, 2021 CB Insights). These four regions used \$48.7B, leaving only \$21.2B (30%) for the rest of the country. \$13.5B went to the next 10 metro areas. So, the top 14 metro areas received \$62.2B, which leaves \$7.8B for the other 378 metro areas; 11.2% of the VC investments for 96.4% of U.S. metro areas.



In addition, the SBIR program works to actively boost opportunities among geographically disenfranchised regions and disadvantaged businesses, as well as women-owned small businesses, such as by leveraging the nation's dramatic spread of "innovation hubs" in geographically disenfranchised regions, led by regional industry/academic/ government partnerships, and redefining STEM. In one example, GSA's new transition support for Phase III transitions has led to 45% women-owned small business participation in Phase III awards.

New products meeting important American STEM challenges are energizing new generations looking for better and more sustainable jobs. Increased heartland investment in SBIR/STTR can become a keystone of America's manufacturing revival. This said, more should be done to support outreach to underserved areas and underrepresented groups.

The SBIR program works well. But it works not simply because the results have been good, but also because the program is structured to work well.

SBIR is Designed for Success

It is important to realize why SBIR works – it is not just accident or the tapping into the small business capabilities, but also in the structure of the program that ensures technology relevance, keeps the focus on the quality of the R&D, and provides checks and balances.

- Taps small business entrepreneurship, innovation, drive and competitive flexibility
 - Small businesses themselves are creative, flexible, innovative, entrepreneurial, and employ 35% of America's scientists.
 - Small businesses are inherently capable of growing and driven to grow
 - Small businesses almost exclusively create their new jobs here in the US, whereas larger businesses and VC-driven firms tend to create most of their jobs worldwide.
- Earliest stage innovation funding while performing R&D for Federal purposes. SBIR/STTR is a unique seed fund for American technological innovation, investing in innovations before Venture Capital or banks are interested while doing R&D wanted by the agencies.
- 3 stage program: Phase 1 is proof of concept. Phase 2 focuses on R&D. Phase 3 is follow-on R&D and commercialization. SBIR funding is for Phases 1 and 2. Phase 3 is not done with SBIR funding.
- Agencies control the R&D: Directed to agency challenges supporting agency missions
 - Agencies select topics, select winners, make awards to meet their needs
 - Topics are selected by the agencies to focus the competition among the small businesses, so that specific agency challenges can be addressed.
 - As best run, e.g. at Navy, SBIR is aligned with programs of records' interests and the programs needs drive R&D selection.
- Merit selection based on science and technology and performance
 - Highly competitive: Only 5% of Ph 1 proposals advance to main Phase 2 R&D work.
 - The unwavering use of merit, "pick the best solution", ensures that Federal R&D is always directed to the best potential solution for the best potential outcome.



- Leverages university research: some 50-70% of SBIR work is done either with direct or former university faculty involvement either in the business or at the university. STTR is focused on encouraging company-university partnership.

Small business innovation will grow high quality manufacturing and service jobs, reduce our dependence on imports, reduce debt, improve American competitiveness, and better spread good American jobs throughout all 50 states. *See state by state data in Appendix B.*

The Market loves SBIR

It is well established that the Federal government benefits tremendously from SBIR technology, but the commercial market also values SBIR technology. Some facts that show that SBIR makes a difference include:

- Over 50% of Phase II projects have advanced to commercialization.
- Of the 15 leading Biotech Firms then identified in a Forbes article, 11 were SBIR Awardees (*see Appendix F*)
- 829 SBIR related firms have gone public
- 2,120 SBIR firms have been acquired, invigorating the acquiring businesses
- Many SBIR companies have licensed their technologies, with the licenses reinvigorating the technologies of the larger and older-technology firms that are granted licenses.
- Large Prime contractors have acquired over 100 SBIR firms for \$35 billion. L3 Com, GE, SAIC, BAE, Lockheed Martin, Raytheon, Gen Dynamics, Philips, Teledyne have each acquired 10 or more SBIR Firms. L3 Com alone has acquired 43 SBIR Firms
- Universities license 70% of all their technology to small business and are using SBIR and STTR to help get their technology into the market.
- VC have invested twice as much as the Government in SBIR firms. 10% of all VC investments go to SBIR firms
- For every dollar invested the Navy gets two dollars of follow-on Phase III contracts in addition to subcontracts, licenses and additional investments for a 22:1 ROI.
- There have been 137,443 patents issued to SBIR firms. In most years SBIR firms receive more patents than all colleges and universities combined.
- The SBIR/STTR Programs have been copied by seventeen countries around the world, with other small business R&D investment by many. Including China. The European Union is investing over 20% of its R&D in small businesses.⁶

⁶ <https://ec.europa.eu/programmes/horizon2020/en/area/smes>



National Academy of Sciences: Repeated Stamps of Approval for SBIR

While the Government Accountability National Academy of Sciences have scrutinized and reported on SBIR/STTR Program mechanics more than 25 times since 2000, NRC made a definitive SBIR assessment in a series of reports from 2004 to 2009, comprising thousands of pages, on the SBIR programs at the Department of Defense (DoD), National Institutes of Health (NIH), National Aeronautics and Space Administration (NASA), Department of Energy (DoE), and National Science Foundation (NSF)—the five agencies responsible for 96 percent of SBIR operations. **The Rate of technology commercialization across these agencies were found to be from 45 to 70 percent**, and direct university collaboration in between 33 and 63 percent of SBIR awards.

National Cancer Institute

One agency's remarkable success story

The SBIR/STTR economic impact study for the National Cancer Institute showed a return of \$3.68 in taxes for every dollar invested. Unleashing small businesses in the health care field has proven successful, like printing money without the inflationary effect. New innovations, good jobs, and we get back more in taxes than we invested. The study looked at 12 years and 690 NCI Phase II SBIR/STTR awards totaling \$787 million dollars to develop new medical devices, drugs, research tools and in-vitro diagnostics for treating cancer. The results were \$9.1 billion in sales, \$2.9 billion in tax revenues, and 107,918 new jobs, as well as 45 spinouts, 103 licenses, \$4.26 billion in added outside investment, and 103 of the companies being sold to invigorate the larger companies looking for new technologies. SBIR is a GDP and jobs engine producing high leverage economic power. SBIR success stories were for Breast, Lung, Prostate and multiple other cancers. There are literally thousands of success stories here. All of our lives are better for them.

<i>*dollar amounts in millions</i>	NCI ('98-'10)	
Total Awards	690	
Total SBIR/STTR Award Investment	\$787	
Rate of Commercialization	53%	
Cumulative Sales	\$9,144	\$11:1
Follow-on R&D	\$957	\$1.2:1
Total Value of Acquired Firms	\$21,630	\$27:1
Total Outside Investment Funding	\$4,260	\$5:1
Total Economic Output	\$26,100	\$33:1



Areas for Improvement

Congress has driven improvements to the SBIR program: Congress created the SBIR program and has been a primary force driving its evolution and improvement. Congress has made a number of improvements to the program in recent years, such as pilot programs to streamline and simplify the award and contracting processes, allowing GSA to do Phase III contracting, meeting competition in contracting requirements and sole source contracts, and increasing the allocation amount. More can be done to continue to improve and strengthen SBIR/STTR, keeping what has been successful about the programs while working to improve overall effectiveness.

- Greater focus on simplifying and streamlining the proposal and contracting processes
- Better alignment of topics with the longer-term R&D interests of the agency. Greater alignment with the agency primary programs of record.
- Broader outreach to better attract high quality minority, women and rural technology companies and to improve their ability to submit proposals that win based on merit.
- Greater focus on improved and speedier commercial transition of SBIR technologies into commercial market entry or regular Agency R&D programs and purchase programs.
- Look for best practices across programs to help improve the SBIR program. E.g. the Navy SBIR Program is a model of excellence with a proven record of success involving its Program Managers, trained contracting personnel, purposefully making advanced regular program transition investments to rapidly convert the best SBIR projects into products for the warfighter. Other programs have also developed good best practices that could be shared among agencies.
- Even now, with all of the program's successes, many say the program is too small.⁷ It still only uses 3.5% of Federal external R&D \$, whereas small businesses employ some 35% of American scientists and engineers.
- The DOD Section 809 Panel recommends doubling SBIR and RIF for DOD⁸

⁷ For example, see 809 Report, *Supra*.

⁸ DOD Section 809 Panel, Jan. 2018: "Report of the Advisory Panel on Streamlining and Codifying Acquisition Regulations", Sub recommendation 21b.



Areas for Concern

Congress should ensure that new changes do not weaken the drivers that have supported high SBIR performance and potential. We have some concern that changes may be introduced into the program that could harm the high effectiveness of the program. Some see SBIR as a pool of money that their special interest would like to use, some look to tap the funding for use in non-small business R&D, and in other cases some agencies haven't worked their SBIR program to get the most out of them. We suggest that potential changes be evaluated to ensure they are not weakening the reasons that make SBIR work, that are the cores of its success.

- **Make sure the focus stays on merit-selection and the technical R&D:** SBIR success has been the result of sustained investment into merit-selected R&D projects in a two-Phase structure that encourages high quality selection in support of agency objectives and that encourages proof of performance prior to substantial investment.
- **The focus should stay on innovations rather than already-commercialized technologies:** Some groups have looked to invest R&D in already-commercial technologies – we'd argue that SBIR funding isn't for commercialization and is best spent to create the commercial technologies of tomorrow, not to help advance existing commercial technologies. It's the Small Business Innovation Research fund – make sure to use the program to fund small business innovation research, not other things. If an agency wants to advance an already-commercial technology without focus on innovation, this might be considered the role for regular agency program funding for highly advanced technologies where innovation is no longer a key R&D focus.
- **We believe jumbo awards should be funded by regular agency program funding for advanced programs, not SBIR funds:** The system currently supports many high quality R&D investments in Phase II. We are concerned that jumbo Phase II awards (beyond the current limits in the SBIR Policy Directive) sap money away from many other potential awards to over-invest in just a few projects. If an agency considers a project deserving of an unusually large follow-on award, this is better drawn from regular program funds rather than overconcentrating the agency's SBIR program investment into fewer projects. Remember that every SBIR dollar spent on something big means less is spent on multiple potential solutions to agency challenges.
- **Open topics weaken competition:** Some groups have looked to heavily use so-called open topics where there really is no topic but instead a scrum where all ideas compete with all others rather than seeking competition towards specific topics. This misses the opportunity to use the SBIR Phase I process to have companies compete with each other in proposing specific solutions to specific problems, and so have to in Phase I actually prove their proposed solutions. The result is weakened competition and, combined with jumbo awards, increased return on agency lobbying.

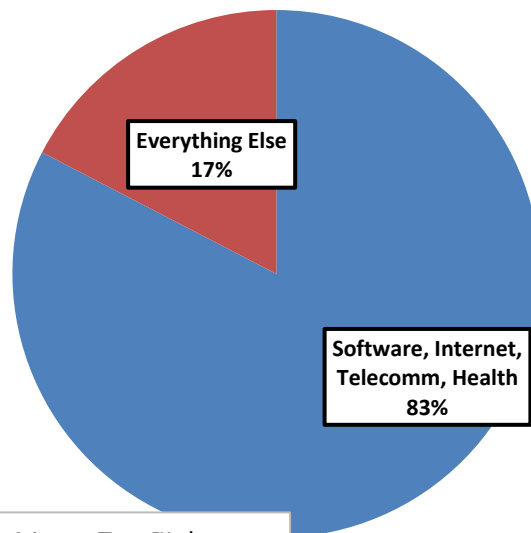


SBIR is often the only source of funding for innovation research

SBIR innovations reflect the needs of America across the nation. In many cases there is no other source of funds for developing early stage technology in America, and this holds true even for advanced stage technologies outside of the favored venture capital/angel industry sectors of software, internet, telecommunications, and healthcare that comprise 83% of the VC deals. All other industry sectors combine for only 17% of the total funds VC invests in seed and angel stage deals. VCs are also focused on only a few states, with most flowing to California and Massachusetts. SBIR funded **7000** deals last year with **\$3,700,000,000** dollars across a wide spectrum of technology, industries and regions.

SBIR/STTR invests at the innovation stage – well before VC and banks will provide risk capital. Successful SBIR technologies do advance to use VC and bank lending as they mature towards products. Also SBIR innovation is directed across America's innovation opportunities, not just in VC-investing sectors such as software, internet, telecommunication and healthcare (receiving 83% of VC deals) but also in higher jobs-producing areas such as manufacturing, defense, energy, and the environment, that are key to building America's good job economy. And small businesses have a great record on keeping their jobs in the U.S.

VC Seed & Angel Deals By Industry Sector, 2011-2020



Source: PwC/CBInsights MoneyTree™ data explorer <http://www.pwc.com/moneytree>

Many universities and government labs have had difficulty translating their research into inventions. A recent Association of University Technology Managers study shows that less than 1% of their licenses generate more than \$1 million, and that 70% of university licenses are with SBIR firms.² Small business and SBIR/STTR are now a huge part of how universities and their professors advance their technologies out of the lab.

But those who can't find funding in the U.S. are turning overseas for help commercializing their research. One Chinese organization, BICI has developed 158 U.S. research projects and has funded over \$616 million for commercialization of U.S. funded research, moving the commercial jobs from U.S. research to China. So far BICI has commercialized 108 such projects.³

Success stories

You probably use technologies initially funded by the SBIR/STTR Program on a daily basis, and probably have at least two of these in your pocket or purse right now. The technology that allows your cell phone to use GPS on a chip was developed by Dr. Reza Rofougaran under an SBIR award. And the fast CMOS camera technology used by most cell phones and digital cameras was developed for military use under an SBIR award as well.

<p>GPS/WiFi/Bluetooth Chips Physical Research/ Broadcom</p>  <p>GPS on a chip, and combined WiFi and Bluetooth communications used globally in cell phones and U.S. military systems, are derived from a DoD SBIR award to Dr. Reza Rofougaran.</p>	<p>CMOS Cameras Photobit/Micron</p>  <p>SBIR supported Photobit in developing fast CMOS imagers for military use, now used in all cell phones and most other digital cameras.</p>
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Successful alumni of the SBIR program include: Qualcomm (cell phone communications), Symantec (computer security), Genzyme (biotech therapies), Affymetrix (GeneChip), Amgen (biopharmaceuticals), Jarvick Heart (artificial heart), Titan (now Intersection, interactive computer graphics), Chiron (pediatric vaccines), AMTI (advanced materials, radars), Amorworks (military armor), Biogen (Idec, neurological, autoimmune therapies), American Biophysics (mosquito control), Millennium Pharma (gene databases), Geron (telomerase inhibitors for cancer treatment), Neocrine Bioscience (neurological and endocrine pharmaceuticals), ABIOMED (world's smallest heart pump), Aerovironment (unmanned aircraft), iRobot (unmanned robotic vehicles, vacuum cleaning, Roomba), JDS Uniphase (fiber optics, lasers, software), Stem Cells Inc. (cell based therapies for CNS and liver disorders), and Nanosys (quantum dot displays), as well as thousands of others. (For more success stories see Appendix D).

Phase III is another area of success. In recent years, the Navy has entered to \$2.5 billion dollars of Phase III contracts, the Air Force over \$1.5 billion contracts and the GSA has entered into contracts that could be worth \$4 billion. All three agencies have shorten the time it takes to get some Phase III contracts awarded.

Appendix A

SBIR Impact on Job Creation & STEM Employment

- SBIR involved firms – current or previous - collectively have been factor in some 9.26% of US STEM jobs
- ...yet as firms, SBIR Awardees in almost every state consistently factor to significantly less than One-Quarter of ONE percent of establishments.

Analysis of extent to which SBIR-STTR Awardees by State (and overall) are factor in US STEM employment							
State	Total State employment ¹	STEM Jobs in state (2020) ²	STEM employment as % total	Total SBIR-STTR Awardees	SBIR-STTR employment ³ (Note 1)	SBIR related STEM employment	% all US STEM jobs
AK	296,300	19,710	6.65%	37	1213	6.15%	0.21%
AL	1,903,210	112,570	5.91%	351	19436	17.27%	1.18%
AR	1,177,860	48,220	4.09%	90	618	1.28%	0.51%
AZ	2,835,100	193,370	6.82%	481	10410	5.38%	2.03%
CA	16,430,660	1,307,860	7.96%	5724	224098	17.13%	13.71%
CO	2,578,000	244,390	9.48%	954	20884	8.55%	2.56%
CT	1,540,870	113,190	7.35%	394	12596	11.13%	1.19%
DC	687,150	72,750	10.59%	135	3539	4.86%	0.76%
DE	426,380	28,710	6.73%	90	2055	7.16%	0.30%
FL	8,441,750	427,060	5.06%	899	20935	4.90%	4.48%
GA	4,308,600	272,580	6.33%	457	7958	2.92%	2.86%
HI	574,010	28,340	4.94%	116	1689	5.96%	0.30%
IA	1,469,920	81,590	5.55%	169	3410	4.18%	0.86%
ID	718,820	44,080	6.13%	100	2349	5.33%	0.46%
IL	5,627,670	337,880	6.00%	732	11329	3.35%	3.54%
IN	5,627,670	337,880	6.00%	327	5356	1.59%	3.54%
KS	1,331,960	79,110	5.94%	120	1342	1.70%	0.83%
KY	1,782,580	80,010	4.49%	183	1901	2.38%	0.84%
LA	1,801,290	69,150	3.84%	122	4414	6.38%	0.72%
MA	3,349,800	320,080	9.56%	2258	100415	31.37%	3.36%
MD	2,523,030	256,930	10.18%	1295	40301	15.69%	2.69%
ME	575,230	30,010	5.22%	126	2676	8.92%	0.31%
MI	3,924,010	291,370	7.43%	707	15466	5.31%	3.05%
MN	2,708,760	199,150	7.35%	393	16375	8.22%	2.09%
MO	2,691,620	156,370	5.81%	290	5334	3.41%	1.64%
MS	1,076,810	38,200	3.55%	66	1448	3.79%	0.40%
MT	455,450	25,760	5.66%	124	2422	9.40%	0.27%
NC	4,288,450	291,450	6.80%	711	15434	5.30%	3.06%
ND	400,040	17,750	4.44%	38	1858	10.47%	0.19%
NE	942,550	56,440	5.99%	80	1327	2.35%	0.59%
NH	619,430	47,970	7.74%	213	10836	22.59%	0.50%
NJ	3,782,740	264,950	7.00%	776	30488	11.51%	2.78%
NM	785,720	52,690	6.71%	349	8396	15.93%	0.55%
NV	1,250,860	48,330	3.86%	99	2362	4.89%	0.51%
NY	8,691,440	489,030	5.63%	1410	34603	7.08%	5.13%
OH	5,137,540	307,910	5.99%	923	23090	7.50%	3.23%
OK	1,562,780	81,190	5.20%	137	3778	4.65%	0.85%
OR	1,806,950	131,590	7.28%	386	11778	8.95%	1.38%
PA	5,512,120	350,520	6.36%	1190	31485	8.98%	3.67%
PR	819,750	36,430	4.44%	24	219	0.60%	0.38%
RI	442,900	28,730	6.49%	122	4574	15.92%	0.30%
SC	2,015,260	102,520	5.09%	166	2658	2.59%	1.07%
SD	411,250	20,380	4.96%	63	830	4.07%	0.21%
TN	2,903,810	150,610	5.19%	284	6422	4.26%	1.58%
TX	12,102,370	811,360	6.70%	1275	34253	4.22%	8.51%
UT	1,489,020	113,790	7.64%	376	11019	9.68%	1.19%
VA	3,701,220	353,730	9.56%	1304	66447	18.78%	3.71%
VT	281,070	16,440	5.85%	84	1566	9.53%	0.17%
WA	3,195,200	340,330	10.65%	796	24018	7.06%	3.57%
WI	2,709,940	167,970	6.20%	388	13834	8.24%	1.76%
WV	650,010	28,690	4.41%	52	1342	4.68%	0.30%
WY	261,690	12,060	4.61%	69	874	7.25%	0.13%
US	142,628,620	9,539,180	6.69%	28055	883460	9.26%	100.00%

Appendix B

FAST Programs in Oklahoma and Montana Provide a roadmap for SBIR Success in Underserved States

2020
Tibbetts Award
Recipient for Top
Organization
& Individual!

OK CATALYST

SPARK OPPORTUNITY. IGNITE CHANGE.

AN OFFICE OF THE TOM LOVE INNOVATION HUB
THE UNIVERSITY OF OKLAHOMA

21

FIRST TIME EVER
AWARDEES

We're Committed to Transforming Oklahoma Into a Leader of Innovation & Technology!
 Through a mix of training, networking, and mentoring we help founders leverage the SBIR/STTR programs to launch new products and grow their business.

Our Programs Offer A Comprehensive Approach to Using SBIR Funding, Not Just Winning It!
 We guide companies through every step of the proposal process, from solicitation matching to the art of competitive writing. We also provide technical and business assistance to maximize their startup success.

ROADMAP

From Lab to Market
 A crash course in technology commercialization for faculty & grad students at Oklahoma's universities & research institutions.

ACCELERATOR

Setting Innovation in Motion
 Intensive 8-week course focused on the DoD, NASA, and NSF SBIR/STTR programs, open to all entrepreneurs in the Heartland.

ENDEAVOR

Now, Go Forth & Conquer!
 Business mentorship & commercialization support for Phase I & II SBIR/STTR awarded companies & owners.

4X

THE NATIONAL
AVERAGE WIN RATE

16M

TOTAL FUNDING
SECURED

55

JOBS CREATED
SINCE 2017

OK CATALYST'S IMPACT SINCE 2017

- Climbed 7 Spots in SBIR/STTR Rankings!**
 Oklahoma's performance with the SBIR/STTR programs has historically been subpar. Since launching OK Catalyst in 2017, Oklahoma has advanced from #46 to #39, according to the FAST FOA announcements for FY22 and FY17.
- Doubled Oklahoma's Annual SBIR Awards!**
 From 1982-2016, Oklahoma received ~12 SBIR/STTR awards annually. In 2019, 21 Oklahoma companies won SBIR/STTR awards. When complete data is available for the calendar year 2020, we anticipate that number to increase.
- Tripled DoD SBIR/STTR Performance!**
 OK Catalyst has focused on improving DoD SBIR/STTR performance in Oklahoma since 2017, and that focus has resulted in a dramatic improvement in the number of companies winning DoD awards and the total amount of DoD SBIR/STTR award dollars coming to Oklahoma.

15

STATES
CONNECTED

125

OUTREACH
EVENTS

400

TRAINING
OPPORTUNITIES

5K

FUTURE FOUNDERS
MENTORED

Montana

Innovation Partnership

powered by TechLink

Growing Montana's Innovation Economy

The Montana Innovation Partnership (MTIP) powered by TechLink is a cooperative partnership between Montana State University TechLink, a center within the Office of Research, Economic Development, and Graduate Education, the Montana Department of Commerce, and the U. S. Small Business Administration through the Federal and State Technology (FAST) program.

We help early-stage tech founders and researchers learn about and compete for SBIR/STTR seed funding through outreach, training, business and technical assistance, and collaboration with university, industry, and economic development partners.

Expert SBIR/STTR Assistance and Collaboration

Clients receive tailored no-cost expert consulting, coaching, and mentoring designed to ensure that SBIR is right for their business, to help them identify agencies and funding opportunities, provide guidance on building their team, protecting their intellectual property, customer discovery, commercialization of new technologies, and in-depth proposal preparation guidance and reviews.

SINCE 2018

45%

APPLICATION SUCCESS

12

FIRST TIME

AWARDEES

35%

OF CLIENTS ARE
UNDERREPRESENTED
SMALL BUSINESSES

\$20M

SBIR/STTR FUNDING TO
CURRENT MTIP CLIENTS

A HISTORY OF INNOVATION

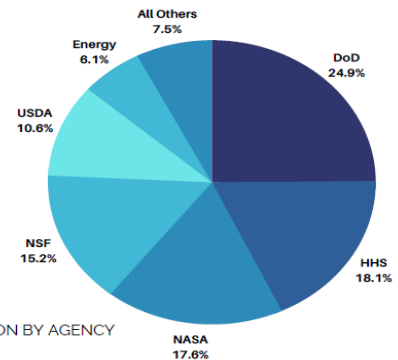
82%

of all Montana SBIR/STTR
awardees have received
assistance from
MTIP/TechLink
in the past
21 years

Montana has one of the nation's top **photonics** clusters, a rapidly growing **bioscience** cluster, and cutting-edge research in **agriculture**, **energy**, and **software**. Sectors that drive innovations addressing our nation's technology needs.

Montana small businesses have received **over \$233 million** in SBIR/STTR funding since the inception of the program.

SBIR/STTR seed funding has allowed over **110 Montana small businesses** to launch, scale, and, for many, attract talent and investment capital to the state.



MONTANA SBIR/STTR AWARD DISTRIBUTION BY AGENCY

Appendix C

State-by-State SBIR/STTR Figures for Senate Small Business Committee

All 50 states have small high technology businesses developing innovation, products and services based on Federal SBIR R&D. Each project provides the opportunity for a state to birth a new product or service, and to further build their tech sector.

Colorado			
Year	SBIR/STTR		
	# Awards	\$ Amount	
2016	261	\$117,195,547	
2017	269	\$115,208,773	
2018	280	\$143,951,628	
2019	332	\$165,647,584	
2020	336	\$164,828,203	
2016-2020	1478	\$706,831,737	

Hawaii			
Year	SBIR/STTR		
	# Awards	\$ Amount	
2016	23	\$13,034,134	
2017	44	\$17,111,879	
2018	36	\$25,449,603	
2019	53	\$26,824,476	
2020	47	\$35,853,778	
2016-2020	203	\$118,273,870	

Delaware			
Year	SBIR/STTR		
	# Awards	\$ Amount	
2016	36	\$17,628,004	
2017	48	\$23,593,900	
2018	43	\$24,436,685	
2019	41	\$20,752,825	
2020	42	\$20,371,210	
2016-2020	210	\$106,782,624	

Idaho			
Year	SBIR/STTR		
	# Awards	\$ Amount	
2016	10	\$3,944,169	
2017	4	\$3,710,758	
2018	6	\$2,474,308	
2019	7	\$2,840,858	
2020	14	\$5,389,211	
2016-2020	41	\$18,359,304	

Florida			
Year	SBIR/STTR		
	# Awards	\$ Amount	
2016	153	\$62,352,880	
2017	176	\$75,328,717	
2018	177	\$84,842,189	
2019	211	\$119,737,967	
2020	200	\$94,615,785	
2016-2020	917	\$436,877,538	

Illinois			
Year	SBIR/STTR		
	# Awards	\$ Amount	
2016	137	\$59,315,299	
2017	137	\$59,186,158	
2018	126	\$69,659,960	
2019	159	\$70,261,176	
2020	145	\$77,194,992	
2016-2020	704	\$335,617,585	

Indiana		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	49	\$18,165,132
2017	56	\$25,787,032
2018	47	\$23,536,414
2019	67	\$22,635,050
2020	56	\$31,697,851
<i>2016-2020</i>	<i>275</i>	<i>\$121,821,479</i>

Kentucky		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	40	\$19,900,156
2017	39	\$20,664,349
2018	42	\$23,127,802
2019	33	\$22,182,782
2020	39	\$24,079,844
<i>2016-2020</i>	<i>193</i>	<i>\$109,954,932</i>

Iowa		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	23	\$9,866,603
2017	21	\$13,178,114
2018	23	\$9,357,882
2019	24	\$8,203,051
2020	20	\$14,834,720
<i>2016-2020</i>	<i>111</i>	<i>\$55,440,370</i>

Louisiana		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	11	\$3,739,876
2017	14	\$7,373,076
2018	21	\$8,049,202
2019	28	\$9,716,725
2020	30	\$12,482,119
<i>2016-2020</i>	<i>104</i>	<i>\$41,360,998</i>

Kansas		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	9	\$5,930,196
2017	14	\$6,549,569
2018	22	\$6,914,915
2019	21	\$8,003,117
2020	24	\$9,679,956
<i>2016-2020</i>	<i>90</i>	<i>\$37,077,753</i>

Maryland		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	254	\$134,642,799
2017	300	\$141,846,940
2018	274	\$148,513,218
2019	303	\$174,584,237
2020	346	\$191,074,380
<i>2016-2020</i>	<i>1477</i>	<i>\$790,661,876</i>

Massachusetts		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	551	\$302,188,905
2017	665	\$331,008,323
2018	592	\$354,303,552
2019	726	\$408,526,202
2020	718	\$406,770,283
2016-2020	3252	\$1,802,797,265

Nevada		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	14	\$8,450,112
2017	12	\$5,795,176
2018	10	\$4,644,449
2019	11	\$6,573,137
2020	14	\$6,717,333
2016-2020	61	\$32,180,207

Minnesota		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	79	\$37,954,870
2017	97	\$50,338,415
2018	78	\$43,648,405
2019	96	\$62,420,237
2020	77	\$53,046,237
2016-2020	427	\$247,408,164

New Hampshire		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	73	\$33,219,396
2017	83	\$39,266,112
2018	91	\$45,658,021
2019	111	\$60,618,779
2020	87	\$57,367,599
2016-2020	445	\$236,129,907

Missouri		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	40	\$17,554,613
2017	44	\$23,364,320
2018	60	\$27,263,342
2019	62	\$31,680,401
2020	56	\$30,876,151
2016-2020	262	\$130,738,827

New Jersey		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	122	\$56,448,477
2017	121	\$60,681,490
2018	101	\$49,584,048
2019	146	\$71,147,862
2020	128	\$61,782,493
2016-2020	618	\$299,644,370



Oklahoma		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	19	\$7,546,360
2017	17	\$11,997,731
2018	16	\$7,545,586
2019	26	\$11,156,481
2020	25	\$13,221,342
2016-2020	103	\$51,467,500

Washington		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	114	\$63,413,248
2017	110	\$60,519,129
2018	104	\$59,459,677
2019	125	\$62,592,823
2020	151	\$84,348,352
2016-2020	604	\$330,333,230

South Carolina		
	SBIR/STTR	
Year	# Awards	\$ Amount
2016	22	\$12,936,200
2017	26	\$14,575,458
2018	24	\$11,566,001
2019	33	\$17,902,975
2020	40	\$18,639,883
2016-2020	145	\$75,620,517

Appendix D

SBIR/STTR Success Stories

The SBIR and STTR programs have experienced considerable success in meeting agency needs as reported by National Research Council (NRC). The agencies first provided reports of these successes and later developed web sites listing their successes. In some cases they improve agency research, in others they resulted in new products that could be commercialized, and for DoD, there were new products that provided advanced technology to the warfighters on a quick-reaction basis. Almost all of the SBIR/STTR agencies post their SBIR/STTR success stories on their web sites as follows:

- a. SBIR Success Stories: <https://www.sbir.gov/news/success-stories>
- b. DOD: <http://www.acq.osd.mil/osbp/sbir/about/success-stories.shtml>
- c. NIH : <https://sbir.nih.gov/statistics/success-stories>
- d. DOE: <http://science.energy.gov/sbir/highlights/>
- e. NIST/DOC: <http://www.nist.gov/tpo/sbir/sbir-success-stories.cfm>
- f. USDA: <http://nifa.usda.gov/impacts>
- g. EPA: <http://www.epa.gov/sbir/sbir-success-stories-and-highlights>
- h. Tibbett's Award & SBIR Hall of Fame: <https://www.sbir.gov/about-tibbetts-awards>
- i. Overall, if one performs a web search for "SBIR Success Stories" there are approximately 59,600 responses on Google and 146,000 on Yahoo (of course, some are redundant).



Appendix E

GSA SBIR Phase III Assisted Acquisition Contracts and Spending

No. of Contracts, Obligations, and Combined Ceiling by Fiscal Year:

Fiscal Year	# Contracts Awarded	Obligations	Total Value
FY18	1	\$13,354,952.70	\$2,260,720.00
FY19	19	\$91,368,632.71	\$774,891,303.60
FY20	29	\$356,159,459.02	\$2,117,542,118.03
FY21	15	\$348,681,813.67	\$1,707,618,772.13
Total	64	\$809,564,858.10	\$4,602,312,913.76

The data reflects SBIR Phase III contracts awarded between May 30, 2018 - Sep 14, 2021. The 64 Phase III contracts include 36 IDIQs, 25 Stand-Alone Contracts, and 3 Purchase Orders.

Breakout by Socioeconomic Class:

Socioeconomic Category	Obligations	Total Value
8(a)	\$63,721,554.96	\$574,612,522.80
EDWOSB	\$64,232,405.26	\$715,000,000.00
HUB Zone	\$3,926,891.70	\$12,260,720.00
OTSB	\$53,632,797.30	\$401,934,657.61
SB	\$755,932,060.80	\$4,200,378,256.15
SDB	\$123,110,873.78	\$1,228,194,583.19
SDVOSB	\$62,576,885.88	\$410,438,034.27
VOSB	\$152,081,826.34	\$808,897,888.54
WOSB	\$256,611,377.63	\$1,758,976,907.34

Appendix F

SBIR Economic Impact

<i>Dollar amounts in millions</i>	<u>DOD ('95-'12)</u>		<u>NCI ('98-'10)</u>	
<u>Awards and Sales</u>	Total \$ Amount	Ratio to Investment	Total \$ Amount	Ratio to Investment
SBIR/STTR Award Investment	\$14,400		\$787	
Rate of Commercialization	58%		53%	
Cumulative Sales	\$121,000	\$8.4:1	\$9,144	\$11.6:1
Military Sales	\$28,000	\$2:1	---	---
Follow-on R&D	\$15,200	\$1.1:1	\$957	\$1.2:1
Total Acquisition Value of Acquired Firms	\$35,600	\$2.5:1	\$21,630	\$27.5:1
Total Outside Investment Funding	\$9,500	\$0.7:1	\$4,260	\$5.4:1

Source: Swearingen, Will and Jeffrey Peterson, "1998-2018 National Economic Impacts from the National Cancer Institute SBIR/STTR Programs"; and "National Economic Impacts from the DOD SBIR/STTR Programs 1995-2018"

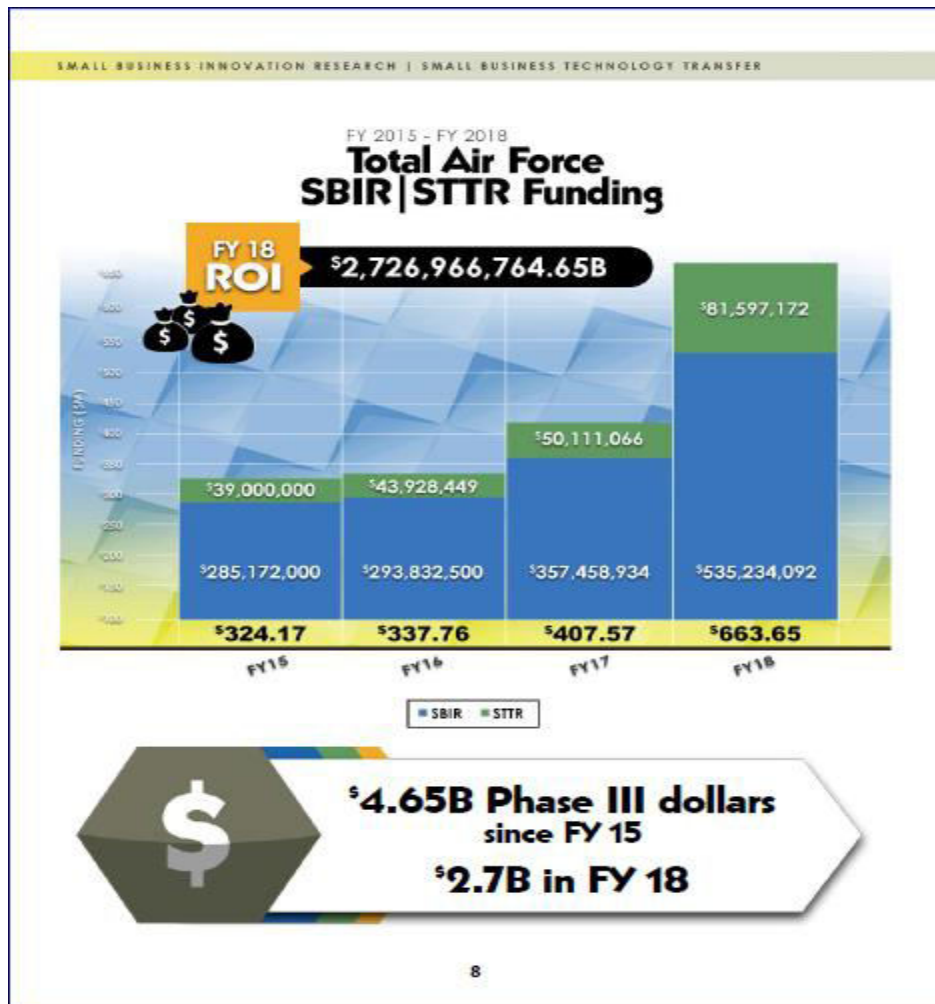
DOD SBIR/STTR Has Been Tremendously Successful



Non-SBIR Phase III Funding by Service, 2018-2021

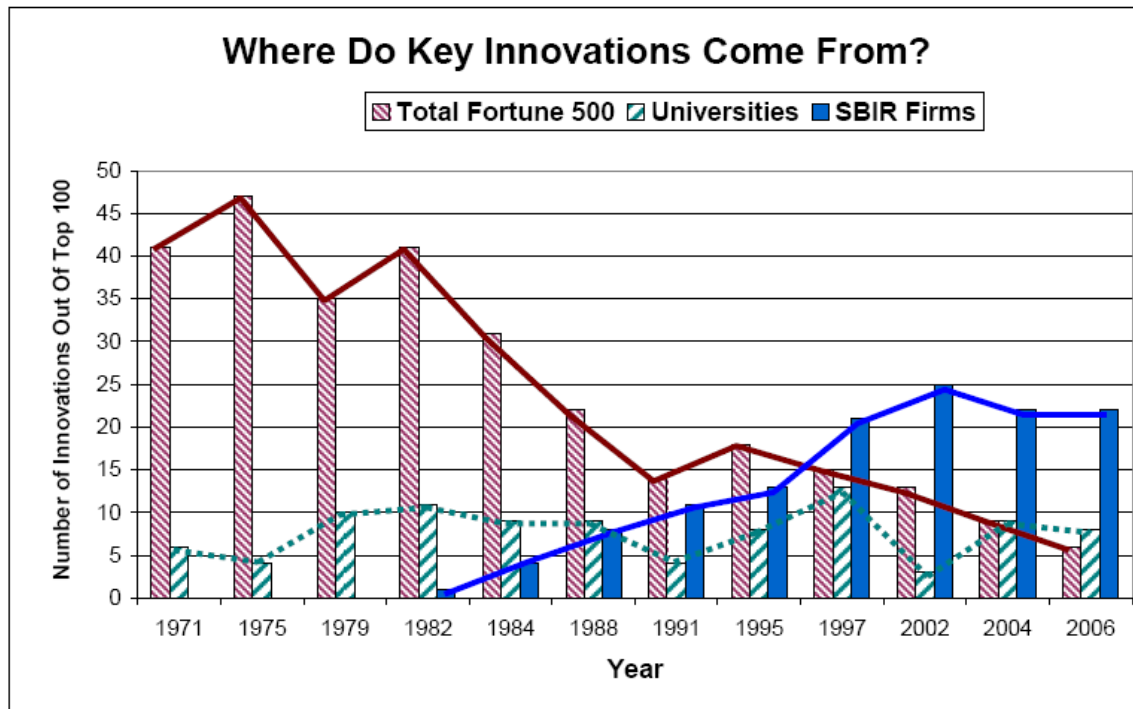
Phase III by Service	2018	2019	2020	First 3 Qs 2021	Total Per Agency
Navy	\$743,134,063	\$674,313,088	\$893,977,509	\$535,807,710	\$2,847,232,369
Air Force	\$391,936,154	\$528,850,815	\$855,060,886	\$359,015,078	\$2,134,862,933
Army	\$151,651,706	\$113,341,936	\$170,912,517	\$135,925,090	\$571,831,249

AF 1st 3 Qs 2020: \$541,662,803



Source: AF SBIR/STTR Year in Review 2018

Over 20% of Key innovations Come From SBIR Firms



11 Out of 15 Top Biotech Firms Won SBIR Awards

Biotech industry:

While one cannot perhaps go quite so far as to suggest SBIR as a/the critical factor in development of biotech, with so many Major Biotechs having an SBIR connection, a viable case can be made for the useful contribution the program probably has made to the emergence, structure and direction of the industry

Early years: Of the Fifteen (15) leading Biotech Firms then identified in a 2016 *Forbes* article, Eleven (11) were SBIR Awardees .. at the time

- In receipt of over \$32M in SBIR funding - all but two awards (both to Vertex) being NIH SBIRs.
- Only one firm –Pharmacyclics – was in receipt of single award.
- Most others made several successful applications with a significant percentage of projects going to Phase II.

Not trivially, in concert with major pharmaceutical and medical device firms, almost all had (still have) working relationships with various other SBIR-STTR Awardees past and present.

“Modern biotechnology provides breakthrough products and technologies to combat debilitating and rare diseases, reduce our environmental footprint, feed the hungry, use less and cleaner energy, and have safer, cleaner and more efficient industrial manufacturing processes”

BIO (Biotechnology Innovation Organization)

With the rapid and continuing growth of the space and arenas that are designated Biotech, it is estimated (by various sources) that of firms identified as leading-edge in their field, Fifty-Two (52) listed here are/have been SBIR-involved.



52 SBIR-involved Biotech firms*

- | | | |
|--|---|---|
| <ul style="list-style-type: none"> • Abraxis – immunochemistry products • Active Motif – epigenetic research • ActivX – in situ kinase profiling • Aduro Biotech – engineered Immunotherapy for Cancer • Advanced Analytical – high-throughput nucleic acid analysis systems • Affymetrix – genomic analysis • Alexion Pharmaceuticals - orphan drugs to treat rare diseases • AllCells – primary human cells • Amgen Inc - human therapeutics: low white blood cell counts, osteoporosis, and colorectal cancer • Aptagen – aptamer-beacon • Biogen Inc. - neurological and neurodegenerative diseases • BioMarin –rare genetic diseases therapies • Caribou Biosciences – engineering any genome • Cellecta – functional screening and drug target discovery • Cellular Research – high-resolution investigation of single cell • Clontech – cloning tools | <ul style="list-style-type: none"> • Covaris – sample preparation by focused-ultrasonication • DiscoverRx – cell-based assays • DNASTar – innovative and easy to use software for scientists • Epitogenesis – vaccine delivery technologies • Fluidigm – single-cell analysis • Genzyme - rare diseases, blood disorders, neurology, immunology, and oncology. • Gilead Sciences - antiviral drug: HIV, hepatitis B, hepatitis C, and influenza • Horizon Technology – automated sample preparation systems • Illumina, Inc. - analysis of genetic variation and biological function • InDevR – accelerate vaccine characterization and production • Integrated DNA Technologies – custom oligonucleotides • InVivoGen – innate immunology specialists • Labcyte – revolutionizing Liquid Handling • Lucigen – isothermal nucleic acid amplification • Lucigen – simplifying genomics • BiomicsMaverix – manage next generation sequencing data | <ul style="list-style-type: none"> • Mimetas – organ-on-a-chip • Mirus Bio – the Transfection Experts • NuGen – genomic sample preparation • Ocata Therapeutics – regenerative ophthalmology • Organovo – 3D bioprinting • Origene – gene-centric, life science tools • ProSci – affinity-purified polyclonal antibodies • RayBiotech – antibody arrays • Ribomed – biomarker detection • Schrodinger – advanced molecular simulations • Second Genome – microbiome modulators • SeqWright – next generation genomics • Somalogic – proteomics tools • Taconic Biosciences – research models • Transgenomic – <i>genetic biomarker identification</i> • Trilink – <i>highly modified oligos</i> • Vertex Pharmaceuticals - <i>transformative medicines for serious diseases: e.g. cystic fibrosis, Hepatitis C</i> • Wyatt Technology – <i>macromolecular characterization</i> • XenoTech – <i>drug metabolism studies</i> • Zymo Research – <i>genome-wide epigenetic analyses</i> |
|--|---|---|

* This list incomplete. Does not include very young, newly-formed entities only now establishing an SBIR presence



